WHAT IS CLAIMED IS:

1. A method for video filtering of an input video sequence by utilizing joint motion and noise estimation, said filtering based on determining the noise level, as characterized by the standard deviation, of the input video sequence as corrupted by unknown noise, said method comprising the steps of:

(a) generating a motion-compensated video sequence from the input video sequence and a plurality of estimated motion fields;

(b) spatiotemporally filtering the motion compensated video sequence, thereby producing a filtered, motion-compensated video sequence;

(c) estimating a standard deviation from the difference between the input video sequence and the filtered, motion-compensated video sequence, thereby producing an estimated standard deviation;

(d) estimating a scale factor from the difference between the input video sequence and the motion compensated video sequence; and

(e) iterating through steps (a) to (d) using the scale factor previously obtained from step (d) to generate the motion-compensated video sequence in step (a) and using the estimated standard deviation previously obtained from step (c) to perform the filtering in step (b) until the value of the noise level approaches the unknown noise of the input video sequence, whereby the noise level is then characterized by a finally determined scale factor and standard deviation.

2. The method of claim 1 wherein step (a) comprises generating the estimated motion fields between temporally adjacent frames of the filtered, motion-compensated video sequence, and using the estimated motion fields to generate the motion-compensated video sequence from the input video sequence.

3. The method of Claim 1 wherein the iterations in step (e) are carried out until the change in estimated noise level is less than a predetermined threshold.

4. The method of Claim 1 wherein the iterations in step (e) are carried out until a predetermined number of iterations has been reached.

5. The method of Claim 1 wherein step (a) employs motion estimation and compensation to establish temporal trajectories of moving points and enhance temporal correlation between points across frames.

6. The method of Claim 1 wherein the spatiotemporal filtering of step (b) reduces random noise independent of video structure.

7. The method of Claim 1 wherein a robust filter design is used for the motion estimation performed in step (a).

8. The method of Claim 1 wherein a robust filter design is used for spatiotemporal filtering performed in step (b).

9. The method of Claim 7 wherein the robust filter design for the motion estimator uses the scale factor to control the transition between inliers and outliers.

10. The method of Claim 7 wherein the robust function is a Geman-McClure function.

11. The method of Claim 8 wherein the filter design employs the noise characteristics from noise estimation.

12. The method of Claim 1 wherein the video filtering is used to improve video coding and compression efficiency, due to the reduced entropy.

13. The method of Claim 1 wherein the video filtering is used to minimize the storage space for a video clip.

14. The method of Claim 1 wherein the video filtering is used to minimize the transmission bandwidth of a video sequence.

15. The method of Claim 1 wherein the video filtering is used to enhance the video presentation quality, in print or in display.

16. The method of Claim 1 wherein the video filtering is used to extract more distinctive and unique descriptions for efficient video management, organization and indexing.

17. A computer storage medium having instructions stored therein for causing a computer to perform the method of claim 1.

18. Apparatus for video filtering of an input video sequence by utilizing joint motion and noise estimation, said filtering based on determining the noise level, as characterized by the standard deviation, of the input video sequence as corrupted by unknown noise, said apparatus comprising:

a motion filtering module for generating a motion-compensated video sequence from the input video sequence and a plurality of estimated motion fields;

a spatiotemporally filtering module for processing the motion compensated video sequence, thereby producing a filtered, motion-compensated video sequence;

a noise estimation module for (a) estimating a standard deviation from the difference between the input video sequence and the filtered, motion-compensated video sequence, thereby producing an estimated standard deviation, and (b) estimating a scale factor from the difference between the input video sequence and the motion compensated video sequence; and

means interconnecting the motion estimation module, the spatiotemporally filtering module and the noise estimation module for iterating the sequences therebetween using the scale factor previously obtained from the noise estimation module to generate the motion-compensated video sequence and using the estimated standard deviation previously obtained from the noise estimation module to perform the spatiotemporally filtering until the value of the noise level approaches the unknown noise of the input video sequence, whereby the noise level is then characterized by a finally determined scale factor and standard deviation.